

When a user starts using a system, it is assumed that the user will not use the system again.

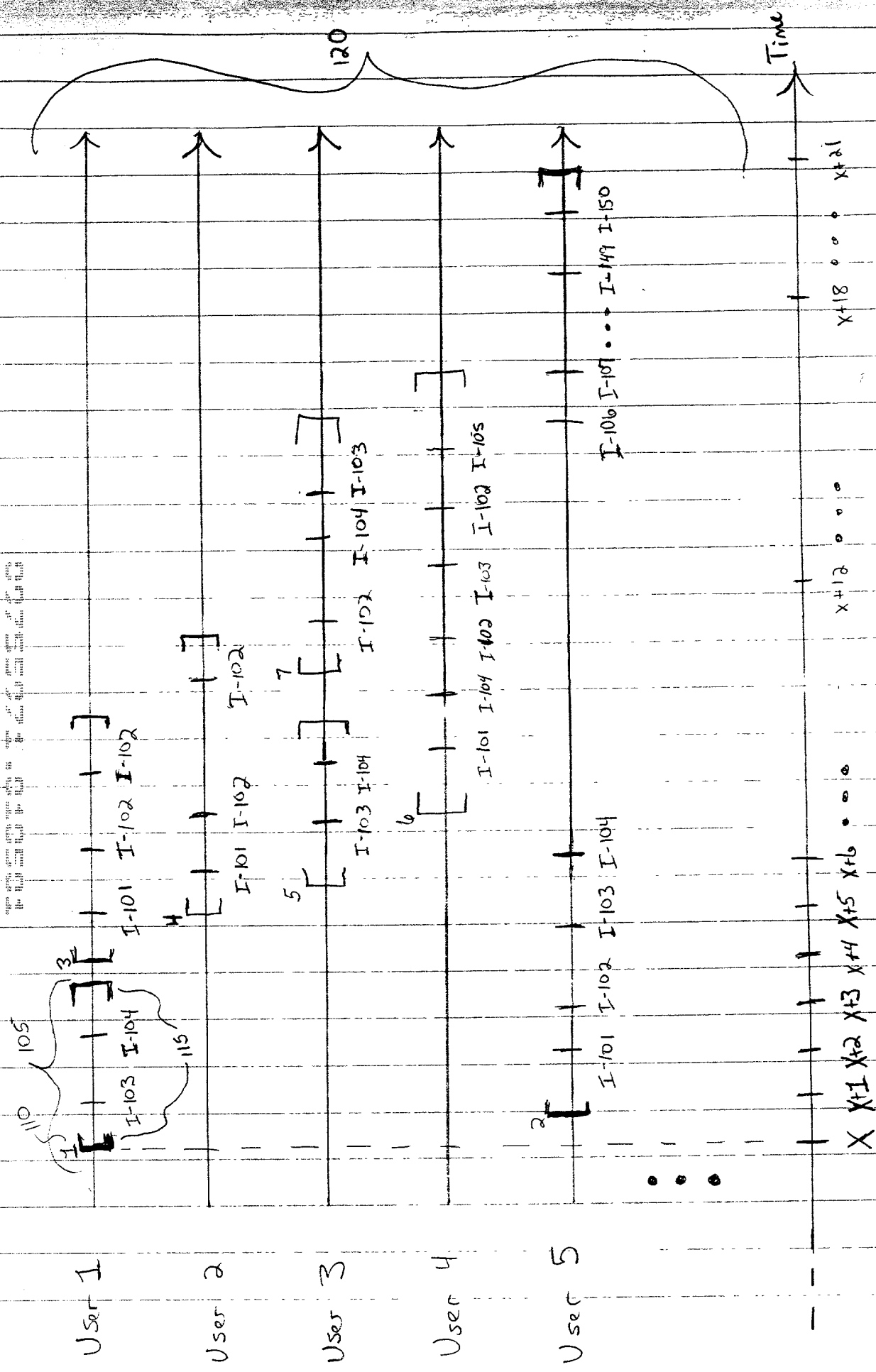


Fig. 1A

Example User/Website Interaction Data
(sorted by user and browsing session)

122	123	124
User	Browsing Session	Interaction Element Identifier
1	1	I-103
1	1	I-104
1	3	I-101
1	3	I-102
1	3	I-102
2	4	I-101
2	4	I-102
2	4	I-102
3	5	I-103
3	5	I-104
3	7	I-102
3	7	I-104
3	7	I-103
4	6	I-101
4	6	I-104
4	6	I-102
4	6	I-103
4	6	I-102
4	6	I-105
5	2	I-101
5	2	I-102
5	2	I-103
5	2	I-104
5	2	I-106
5	2	I-107
:		
5	2	I-149
5	2	I-150
:		

Figure 1B

Example Interaction Element Session Frequency

126	128
Interaction Element Identifier	Sessions With Interaction
I-102	5
I-103	5
I-104	5
I-101	4
I-105	1
I-106	1
I-107	1
:	
I-149	1
I-150	1

Figure 1C

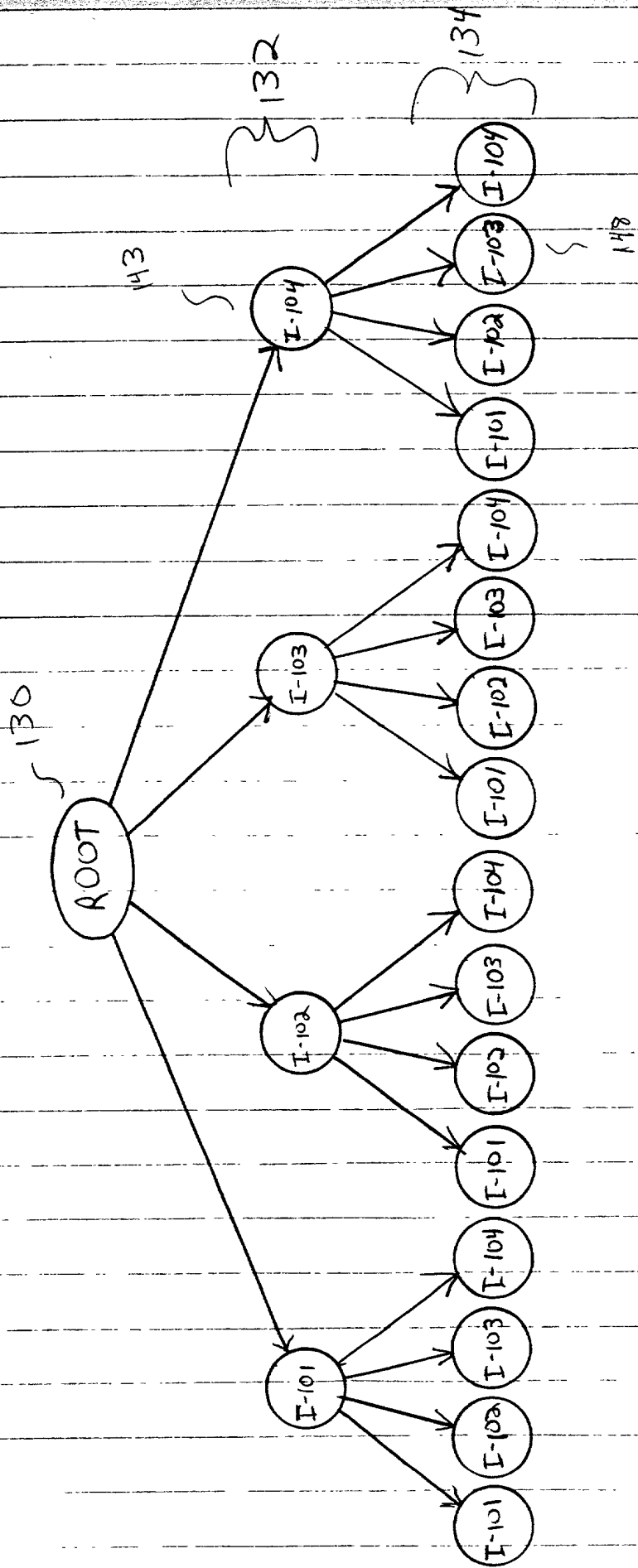


Fig. 1D

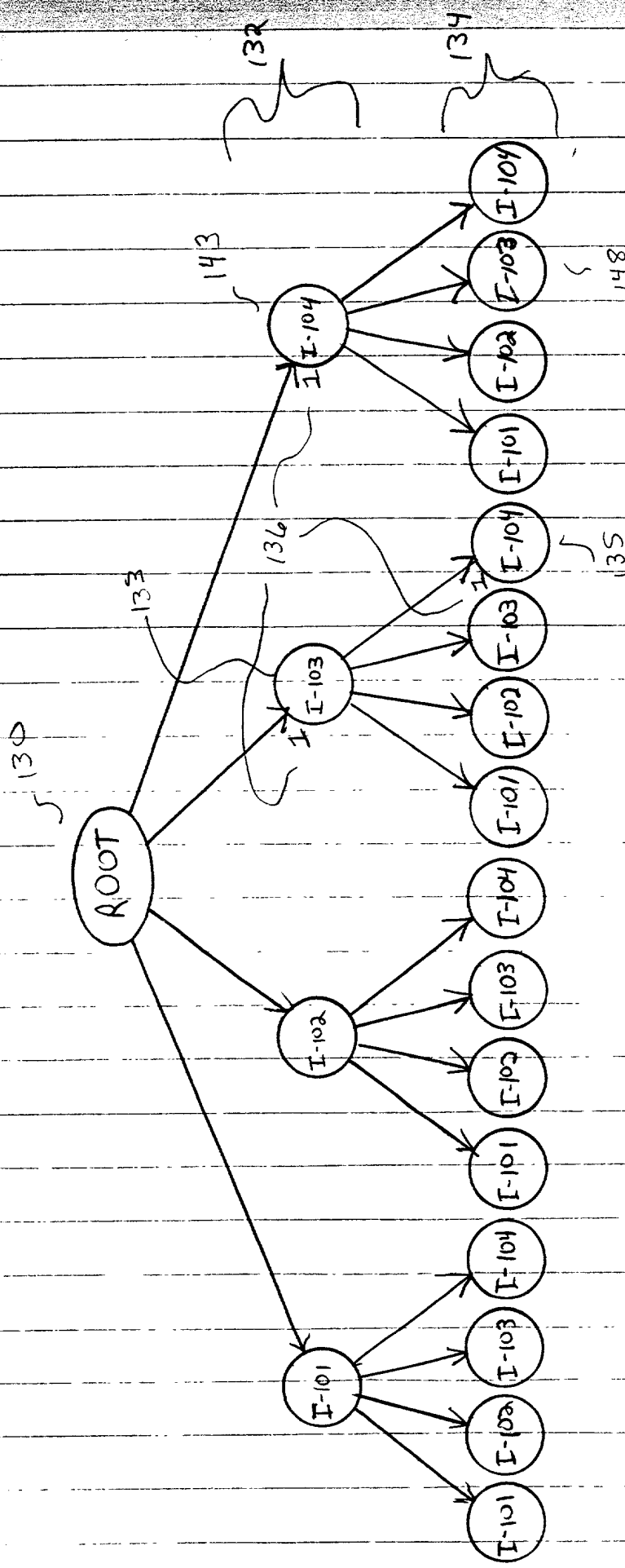
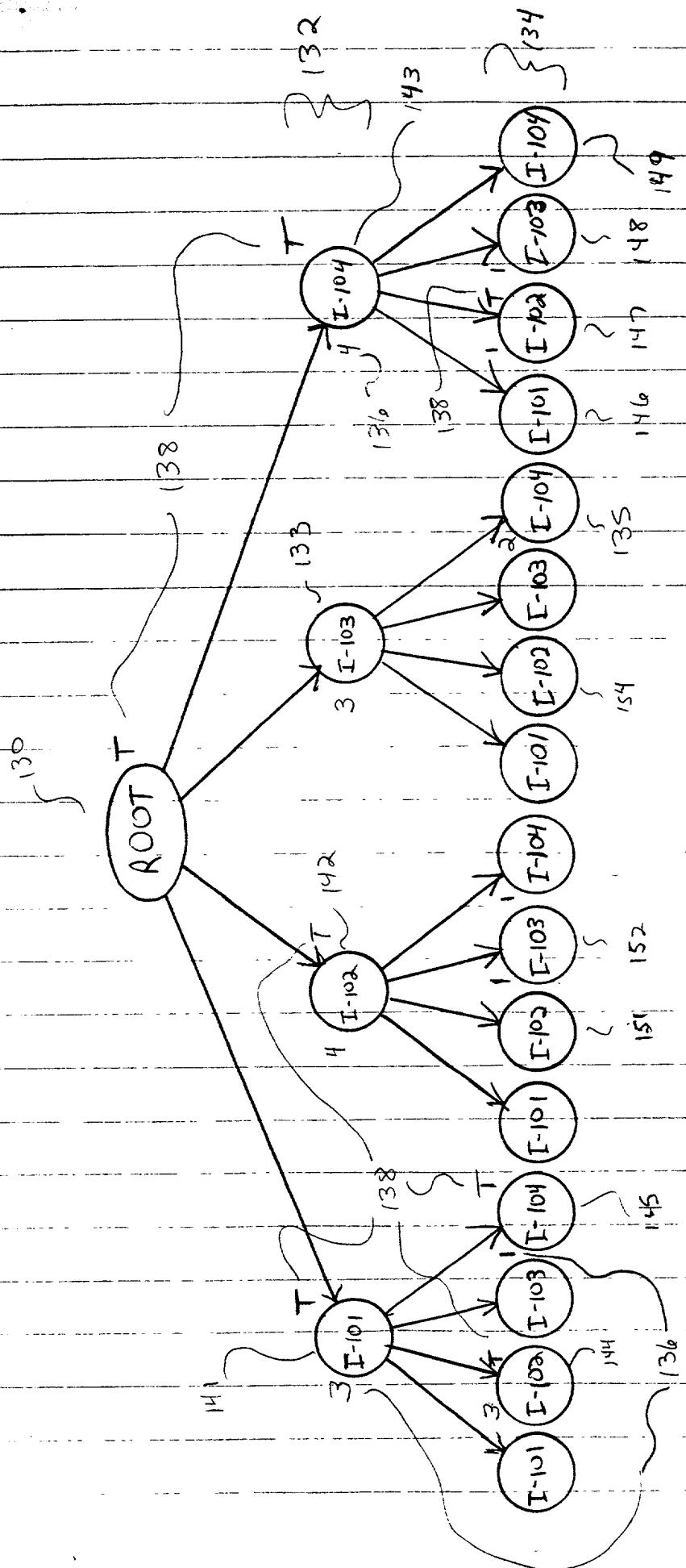


Fig. 1E



Token Node List

Root	130
I-101	141
I-102	142
I-103	143
I-104	144
I-101	145
I-102	147

Fig. 1 F

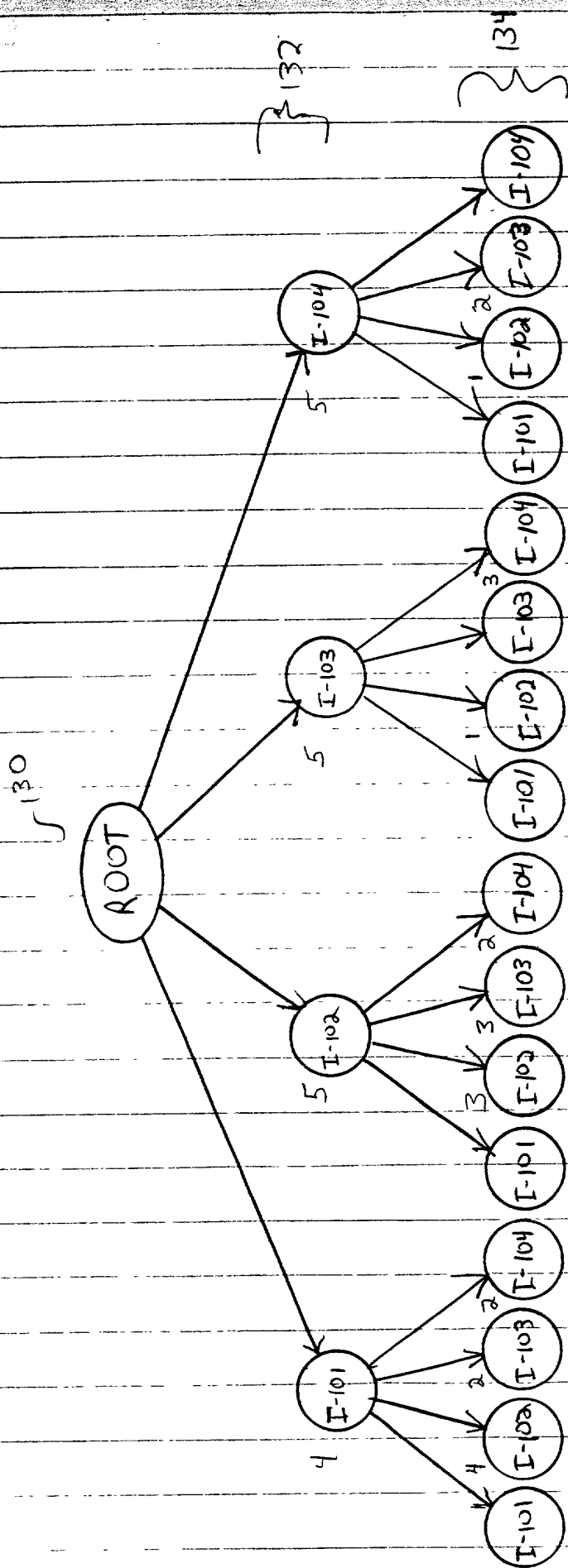


Fig. 1G

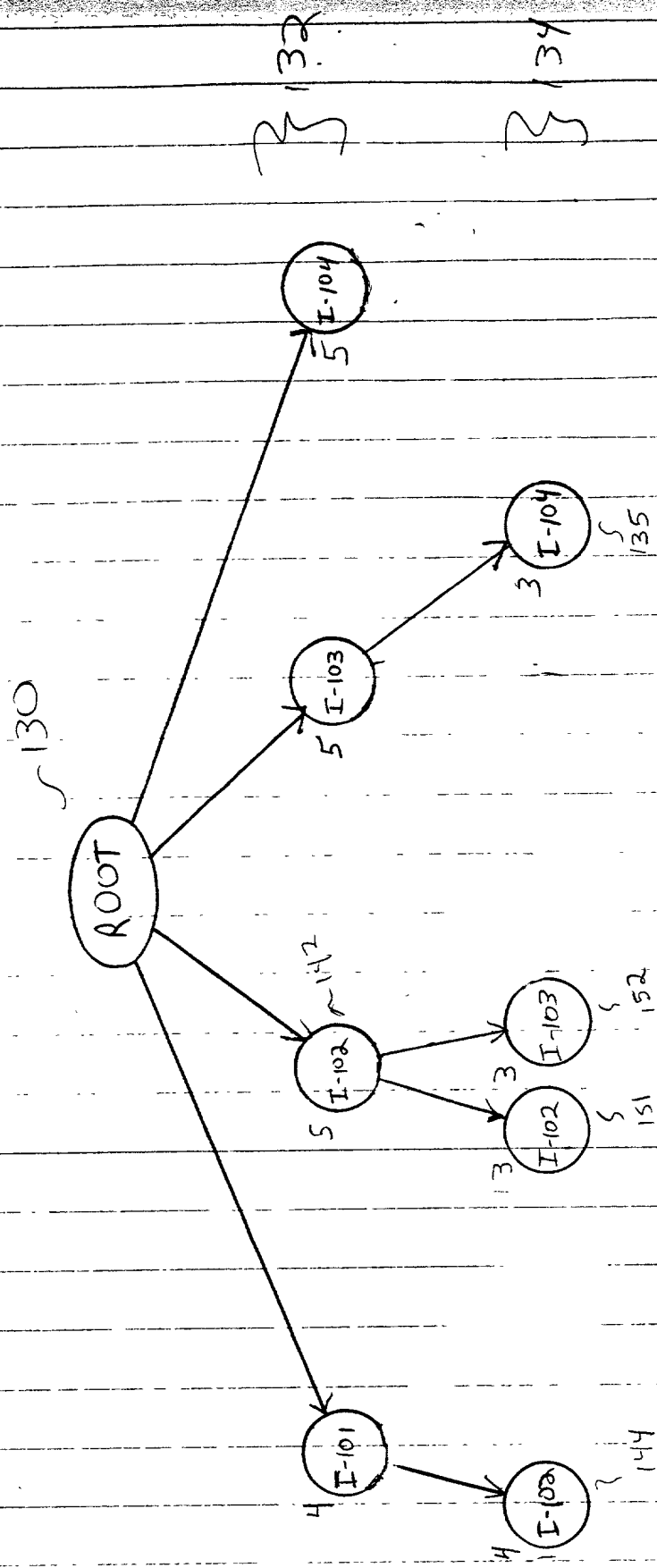
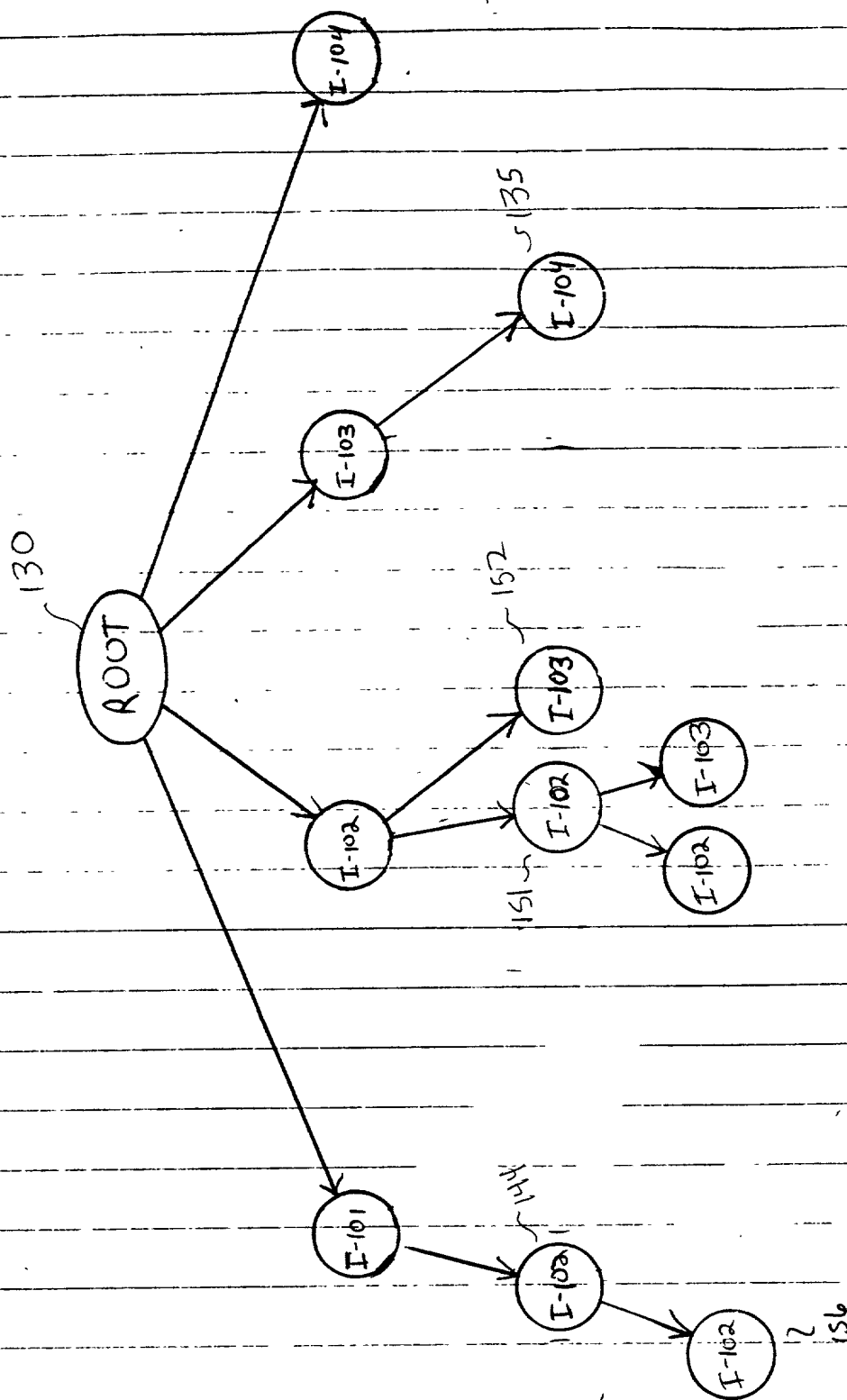
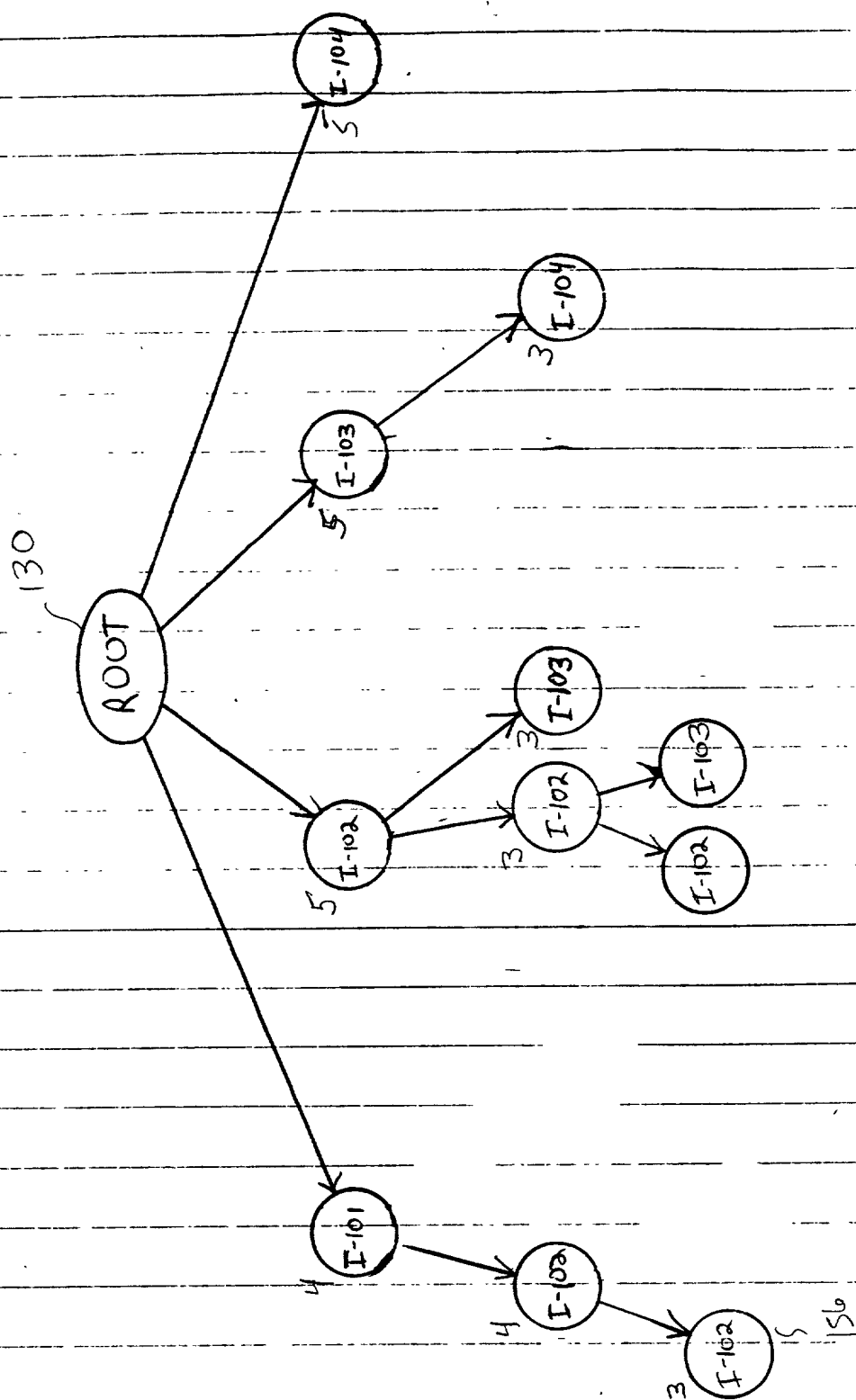


Fig. 1 H



59



49.

When given data, you are given an input, an output, and a goal. The goal is to find the input and output that will result in the goal.

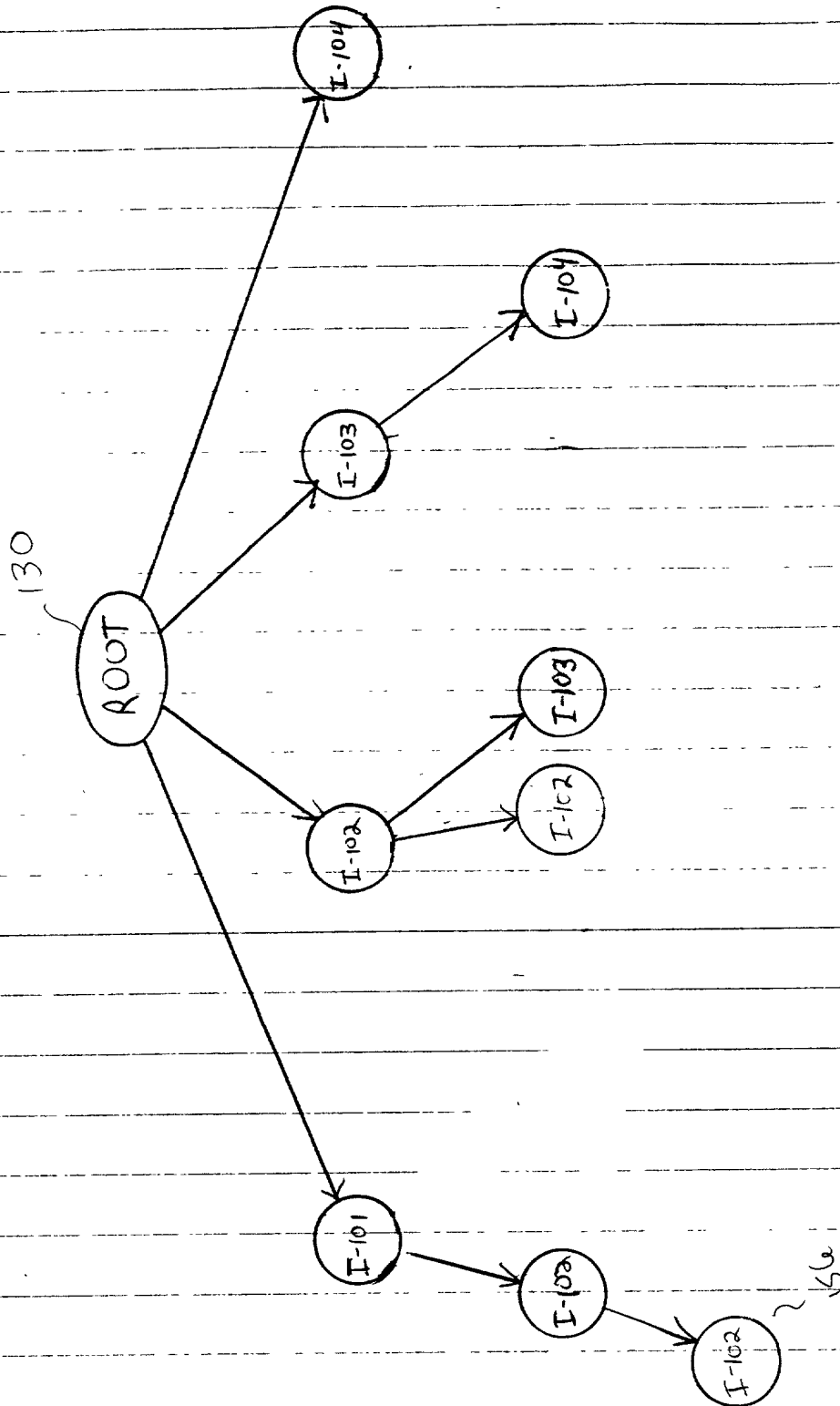


Fig. 1K

Fig. 11

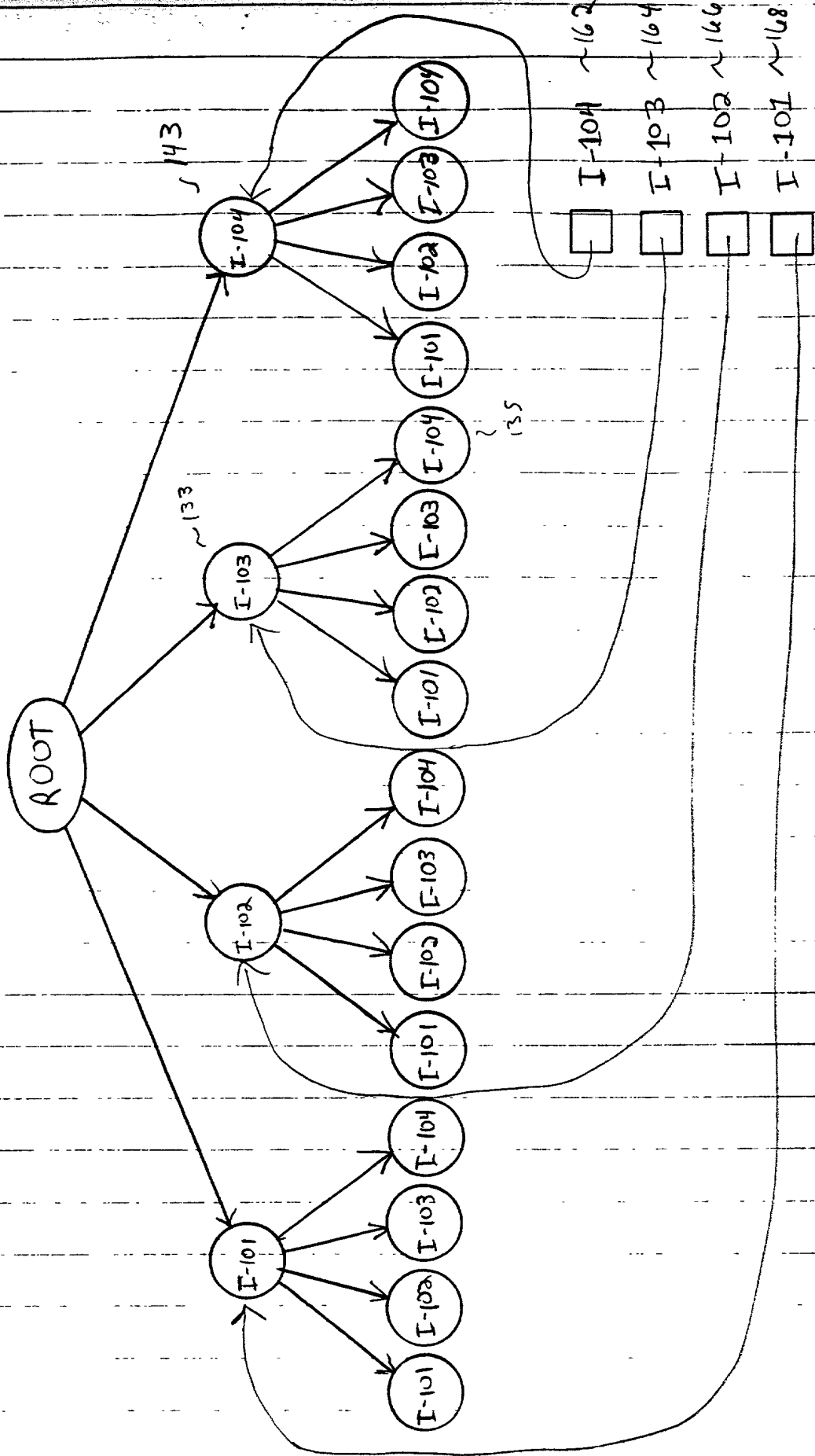


Fig. 1M

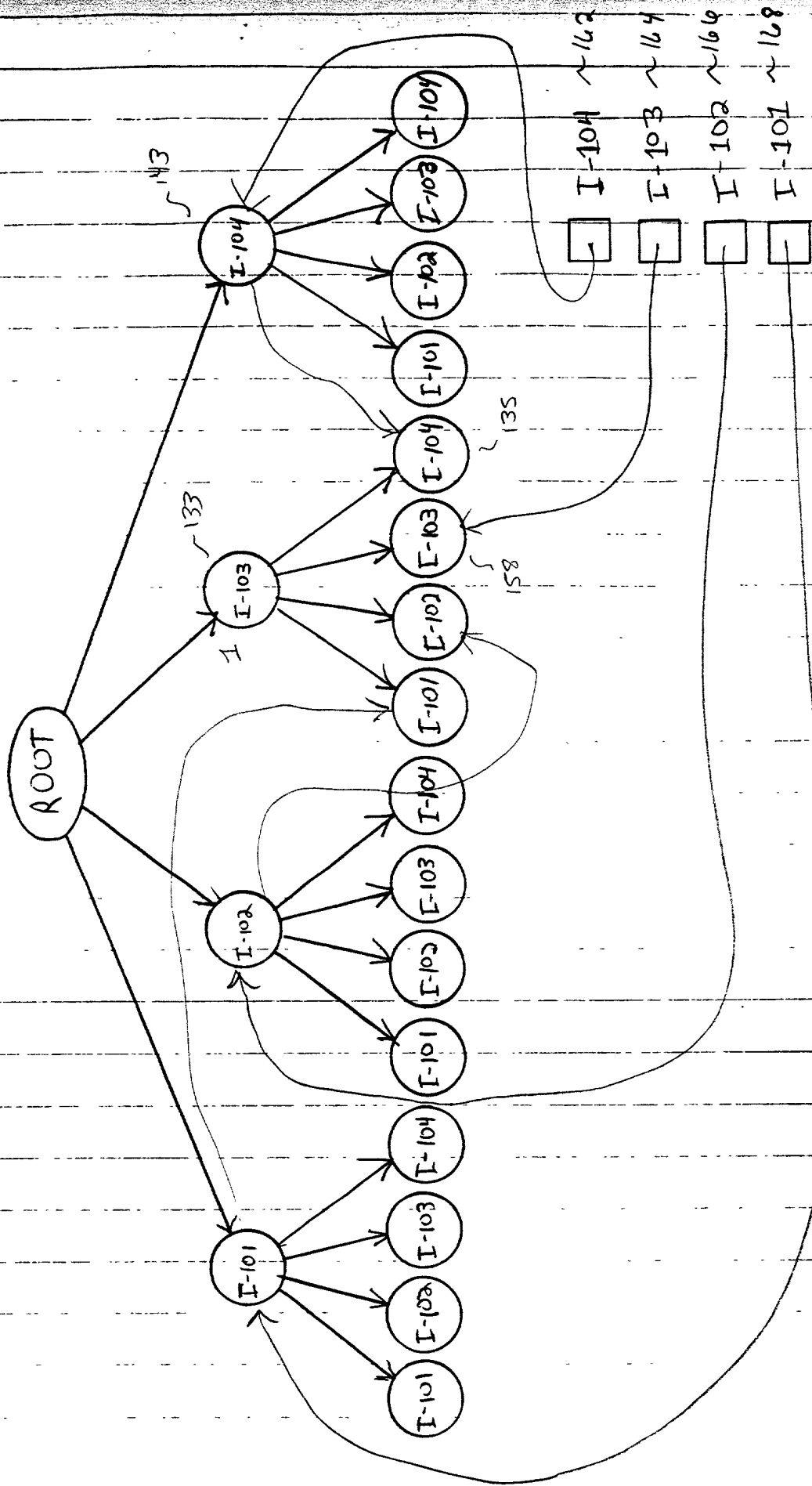
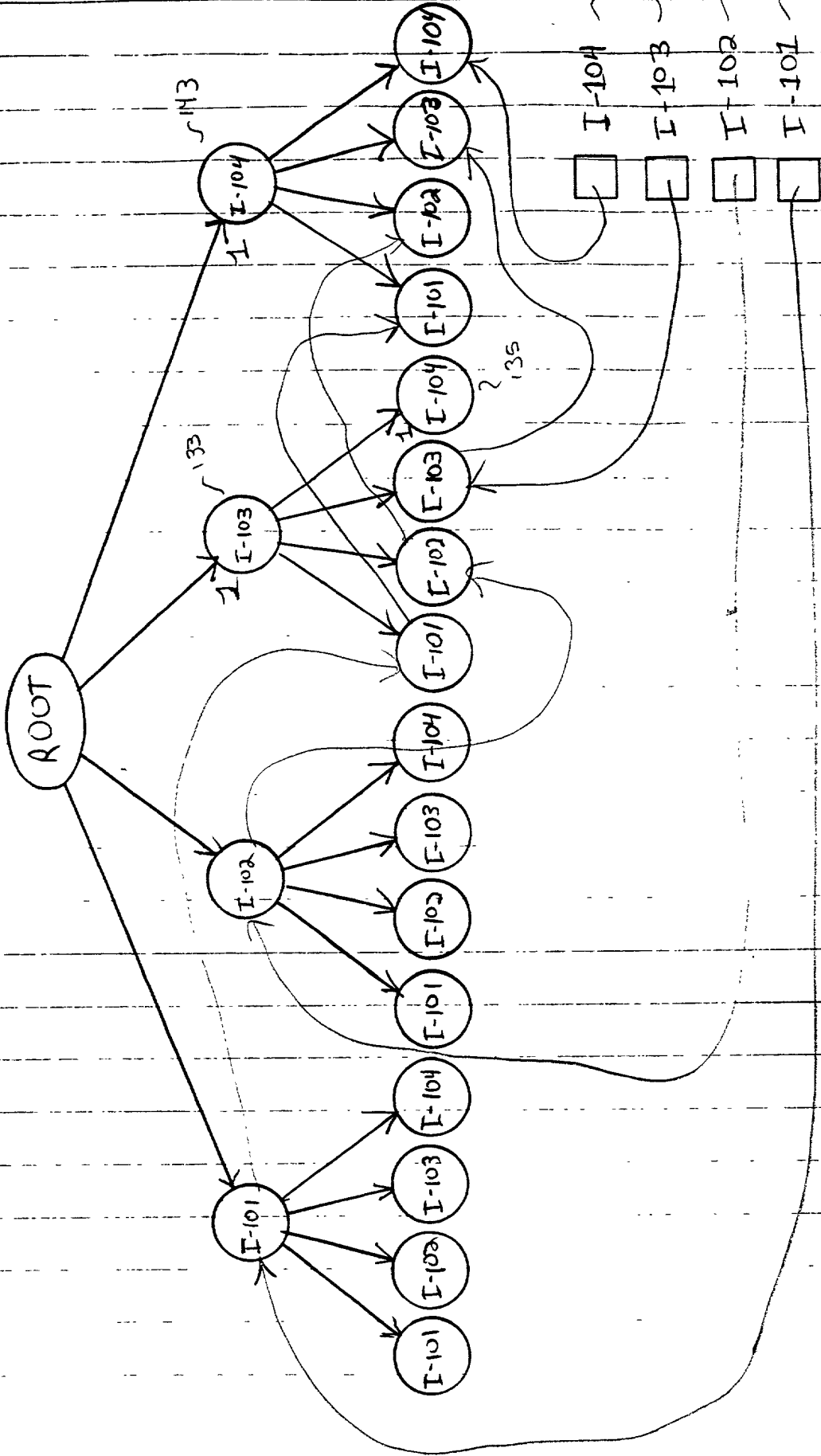


Figure 1 shows a tree diagram of a system of nodes. The root node is labeled "ROOT". The root node has four children: I-101, I-102, I-103, and I-104. Each of these nodes has four children of its own. The nodes are labeled with a code consisting of a letter and a number. The letters are I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z. The numbers are 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100. The nodes are arranged in a hierarchical structure, with the root at the top and the children below it. The nodes are connected by arrows, indicating the flow of information or data from the root to the children. The diagram is a tree structure, meaning that each node has a unique path from the root to it. The nodes are labeled with a code consisting of a letter and a number. The letters are I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z. The numbers are 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100. The nodes are arranged in a hierarchical structure, with the root at the top and the children below it. The nodes are connected by arrows, indicating the flow of information or data from the root to the children. The diagram is a tree structure, meaning that each node has a unique path from the root to it.

Fig. 1N



Example Frequency Sequence Tree Node Data Structures

185

171	Node ID	I-104 143	184
172	Node Parent ID	ROOT 130	
173	Node Children ID List	I-101 146, I-102 147, I-103 148, I-104 149	
174	Session Counter	4	
175	Sequence Length	1	
176	Last Sequence Element	I-104	
177	Token	Yes	
178	Next Linked Node	-	
179	User Counter	3	
180	Number Of Original Intervening Elements	0	
181	Cumulative Sequence Interval Time	0	
		:	

190

186	Node ID	I-103 148	187
	Node Parent ID	I-104 143	
	Node Children ID List	-	
	Session Counter	1	
	Sequence Length	2	
	Last Sequence Element	I-103	
	Token	No	
	Next Linked Node	-	
	User Counter	1	
	Number Of Original Intervening Elements	0	
	Cumulative Sequence Interval Time	1.0 units	
		:	

191

186	Node ID	I-103 148	187
	Node Parent ID	I-104 143	
	Node Children ID List	-	
	Session Counter	2	
	Sequence Length	2	
	Last Sequence Element	I-103	
	Token	Yes	
	Next Linked Node	-	
	User Counter	2	
	Number Of Original Intervening Elements	1	
	Cumulative Sequence Interval Time	3.7 units	
		:	

Figure 10

Figure 1P

Example Frequent 2-Length Sequence Matrix

	second element			
	I-101	I-102	I-103	I-104
I-101	0	4	2	2
I-102	0	3	3	2
I-103	0	1	0	3
I-104	0	1	2	0

first element 192

Figure 1S

Example User/Website Interaction Data (sorted by time)

User	Browsing Session	Interaction Event Identifier	Interaction Time	Interaction Event Category	Interaction Event Price
1	1	I-103	x+01.0	Book	High
5	2	I-101	x+02.0	CD	Low
1	1	I-104	x+02.4	Clothes	Medium
5	2	I-102	x+03.0	CD	Medium
5	2	I-103	x+04.6	Book	High
1	3	I-101	x+05.0	CD	Low
2	4	I-101	x+05.9	CD	Low
5	2	I-104	x+06.2	Clothes	Medium
1	3	I-102	x+06.5	CD	Medium
3	5	I-103	x+07.0	Book	High
2	4	I-102	x+07.1	CD	Medium
1	3	I-102	x+08.0	CD	Medium
3	5	I-104	x+08.2	Clothes	Medium
4	6	I-101	x+08.5	CD	Low
4	6	I-104	x+09.8	Clothes	Medium
2	4	I-102	x+10.0	CD	Medium
4	6	I-102	x+10.9	CD	Medium
3	7	I-102	x+11.2	CD	Medium
4	6	I-103	x+12.5	Book	High
3	7	I-104	x+13.0	Clothes	Medium
4	6	I-102	x+13.7	CD	Medium
3	7	I-103	x+14.0	Book	High
4	6	I-105	x+14.9	TV	Very High
5	2	I-106	x+15.5	Book	High
5	2	I-107	x+16.5	Clothes	Medium
⋮					
5	2	I-149	x+18.6	Clothes	Medium
5	2	I-150	x+19.9	Clothes	Medium
⋮					

Fig. 10

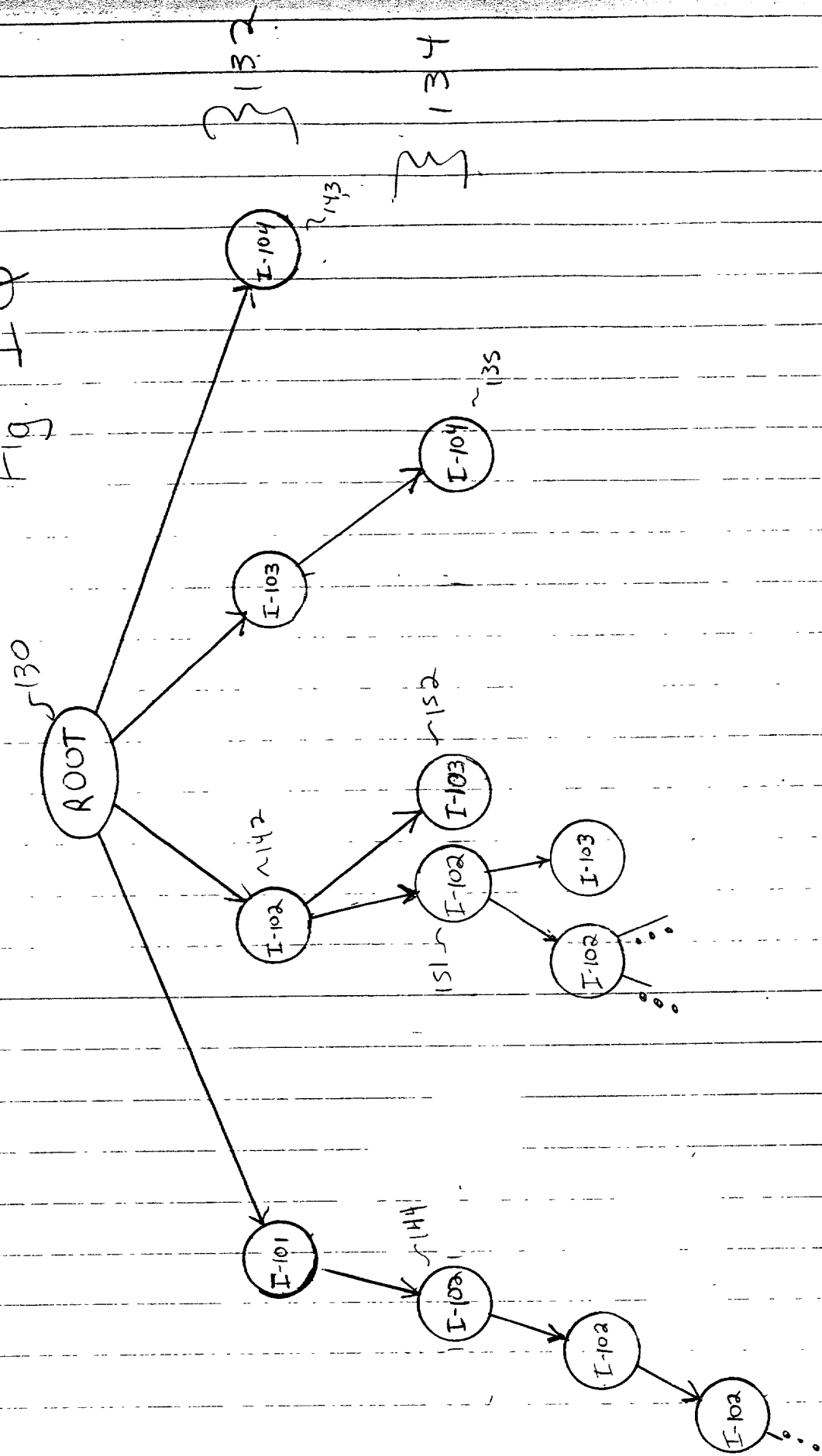


Fig. 1T

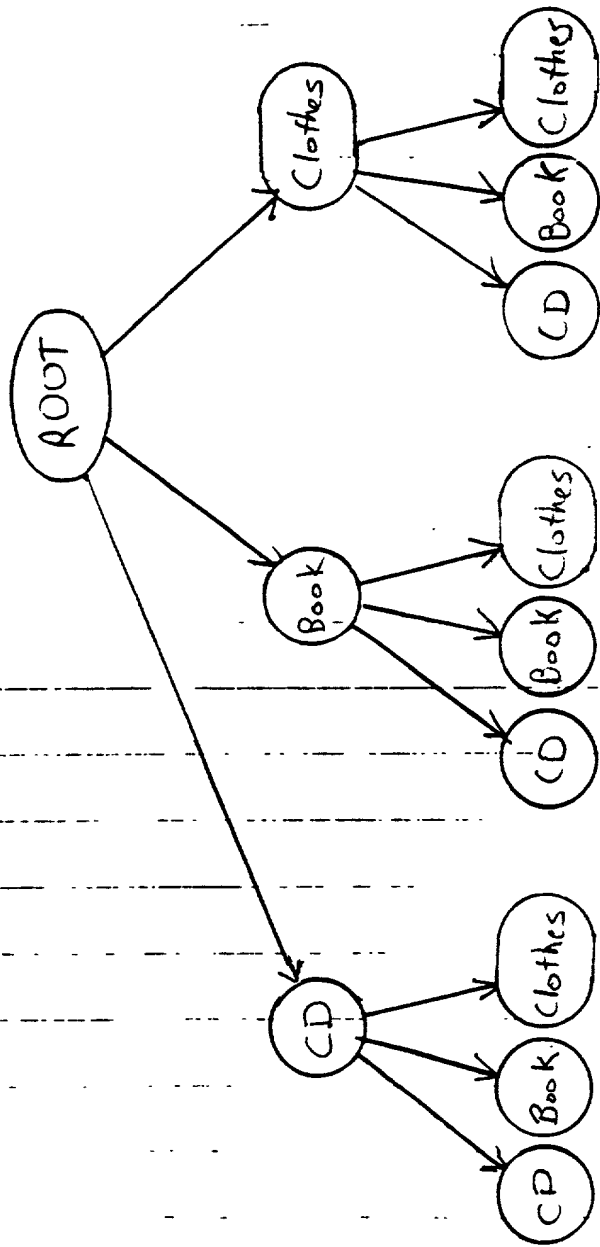


Fig. 1U

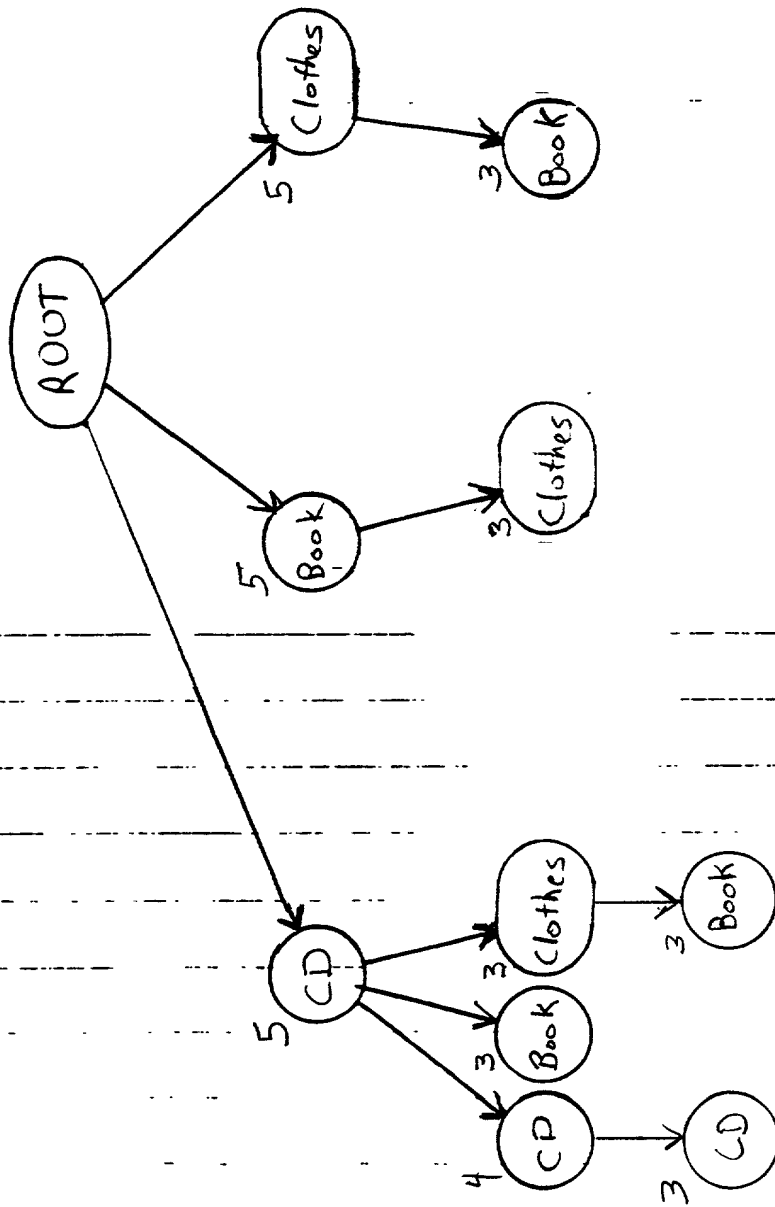


Fig. IV

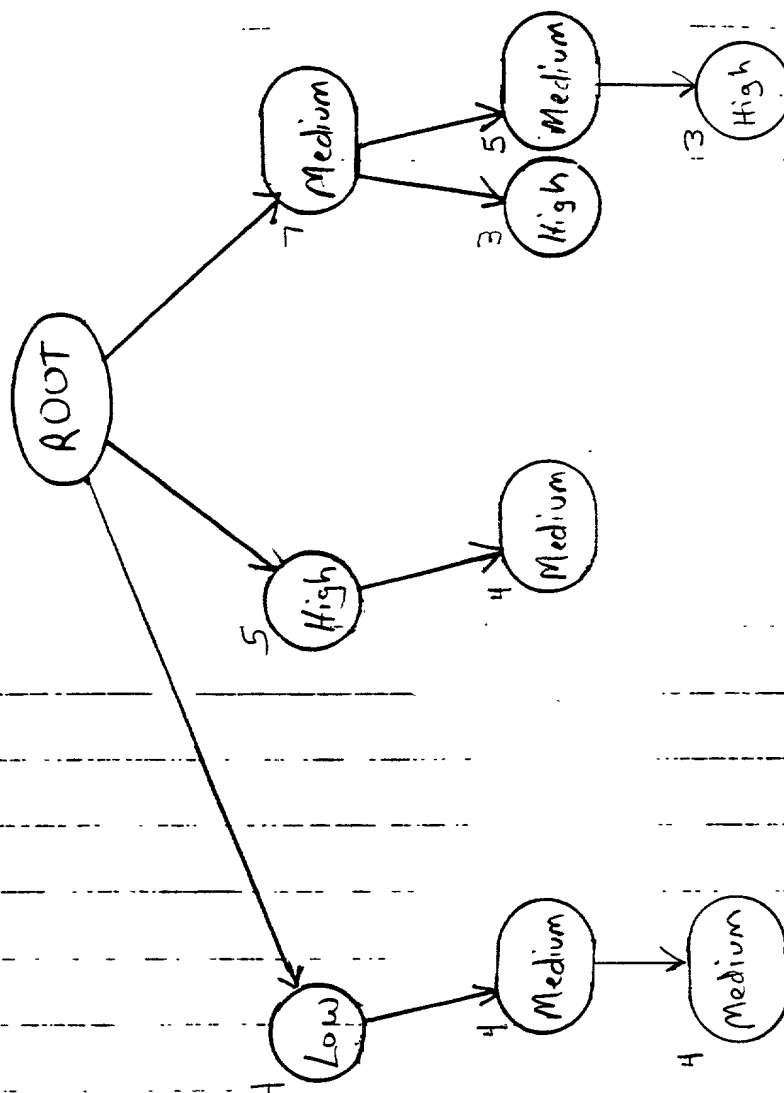


Fig. 1W

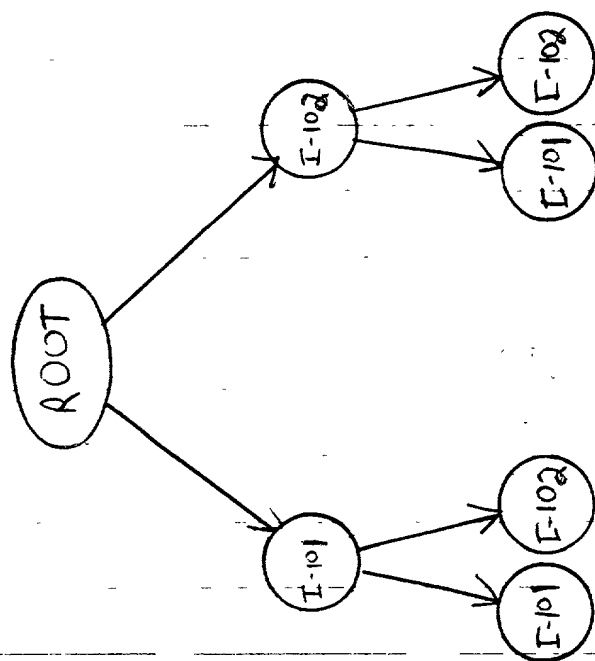
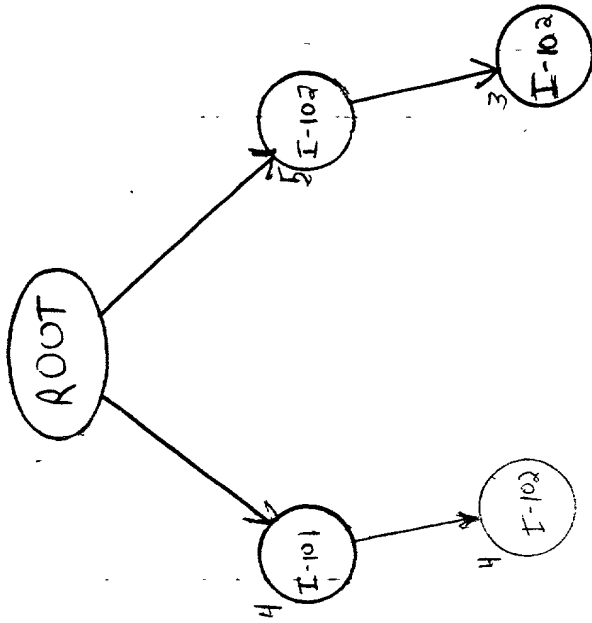


Fig. IX



130

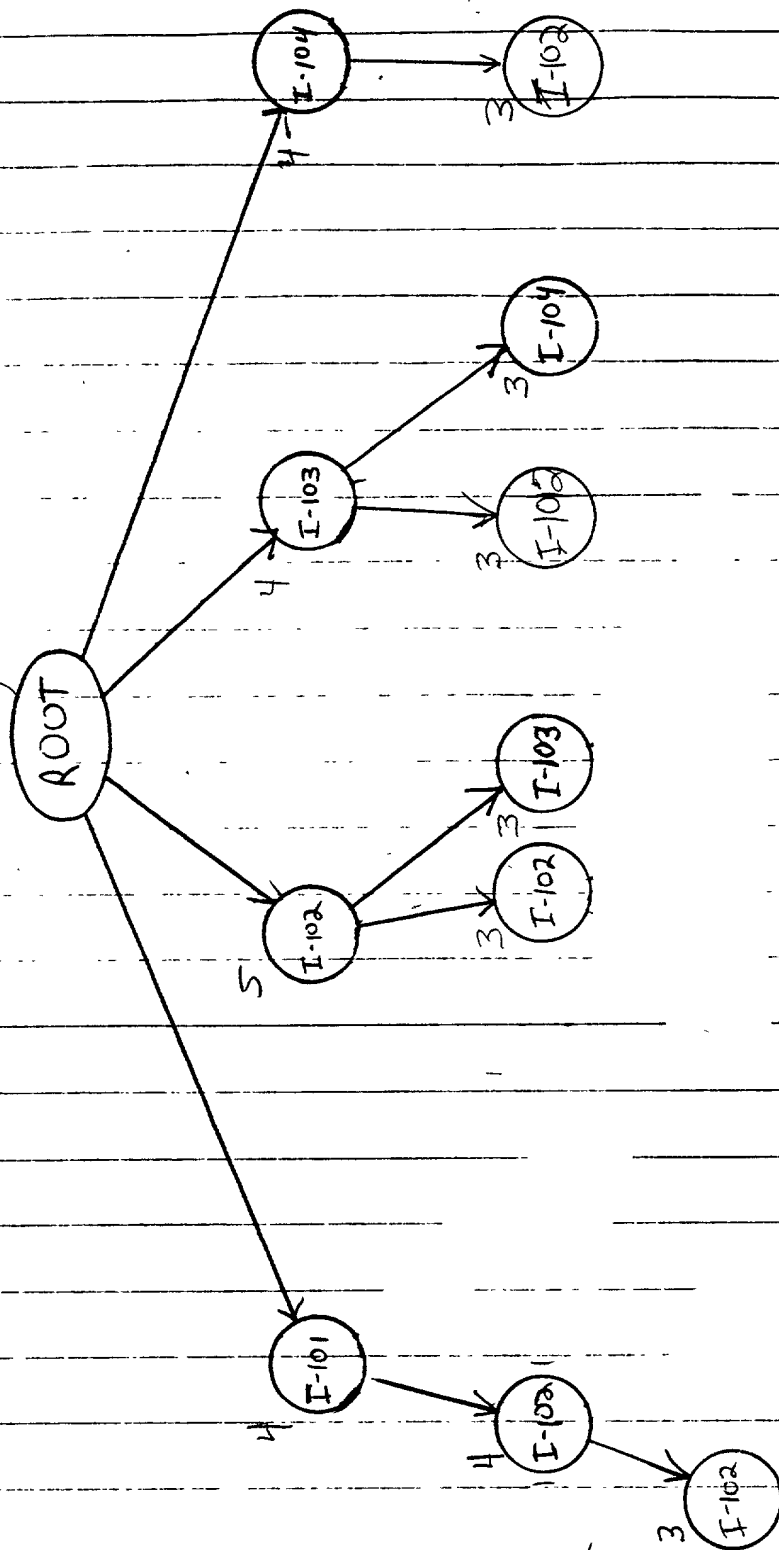


Fig. 1Y

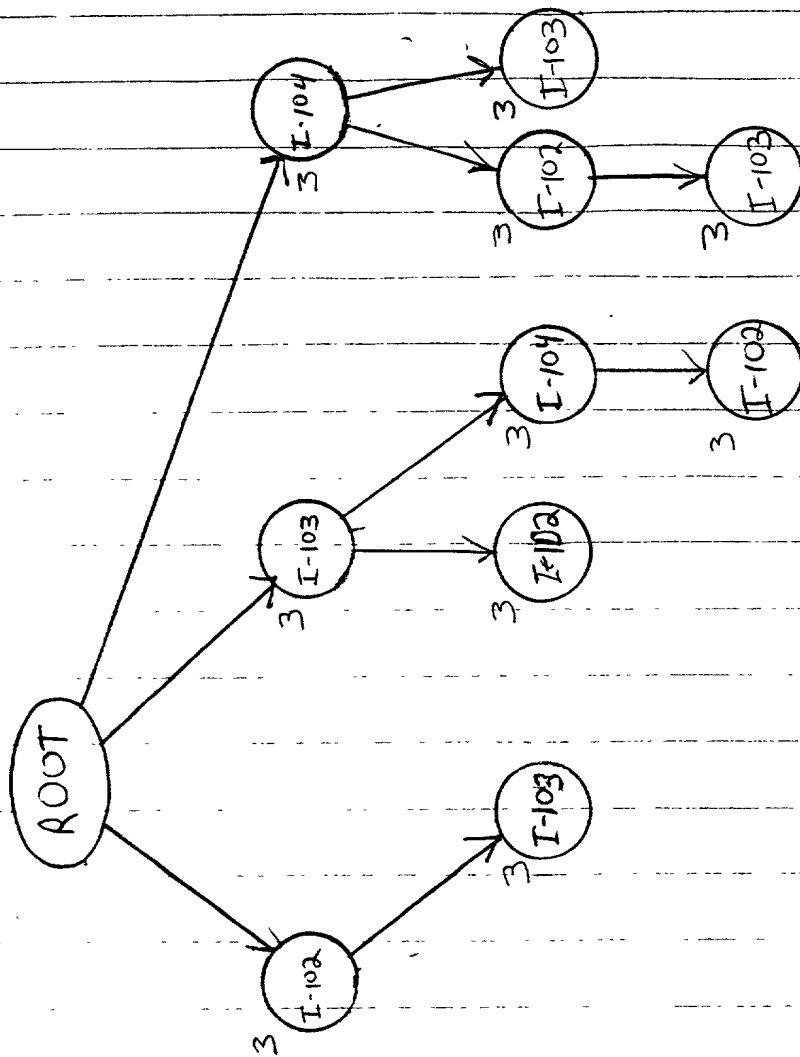


Figure 12

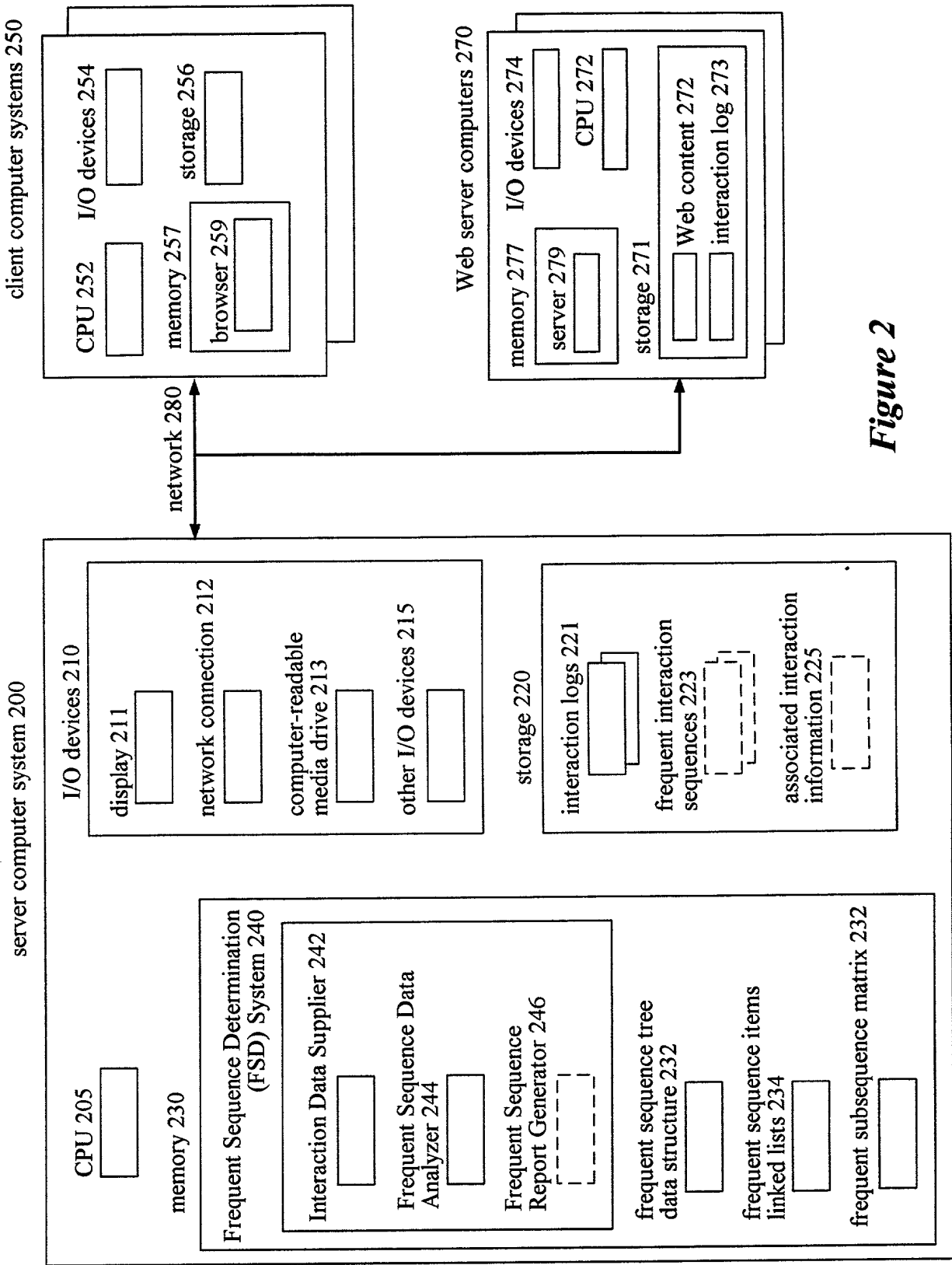


Figure 2

Fig. 3

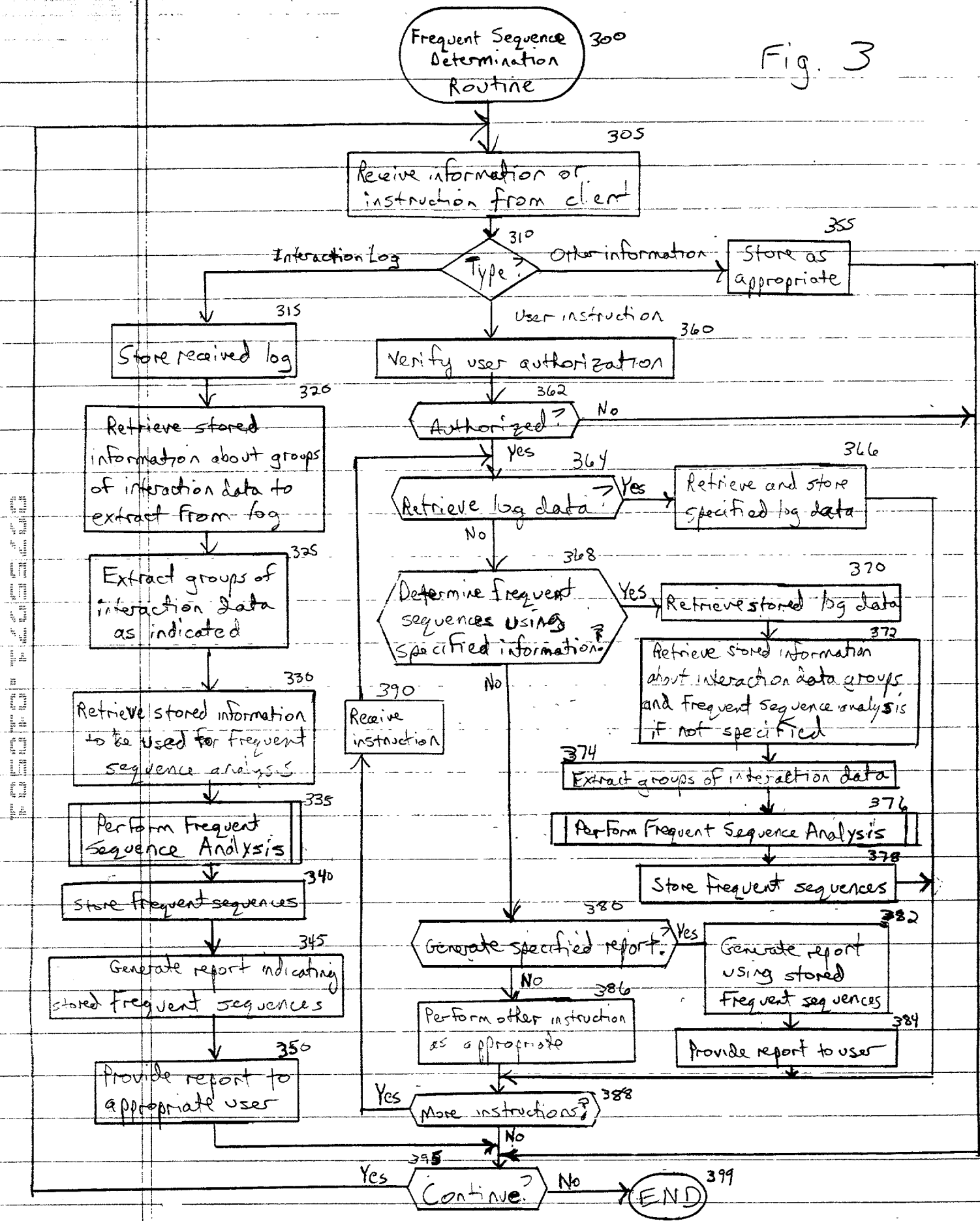
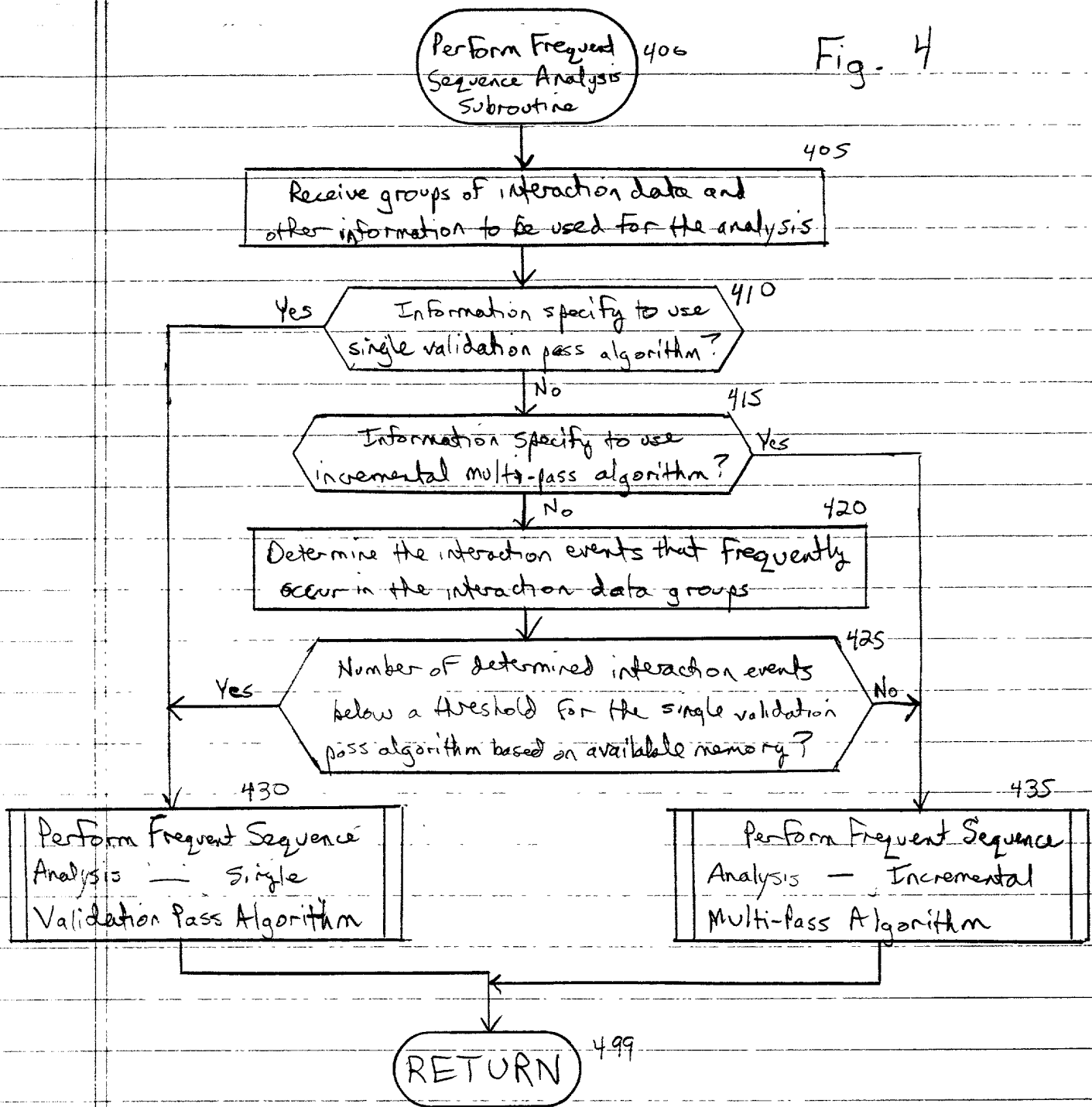


Fig. 4



Perform Frequent
Sequence Analysis-Incremental
Subroutine

435 Fig. 5A

505
Receive groups of interaction data and
other information to be used for the analysis

510
Determine the interaction events that frequently
occur in the interaction data groups

515
Create tree data structure whose root element has
a child element for each frequent interaction event

520
For each element in the current lowest level of the tree,
add a child element for each frequent interaction event if appropriate

525
Initialize counters for each element

530
Select next interaction data group

535
Increment counter for each element whose associated sequence
of interaction events is present in the selected group

540
More groups?

545
Remove elements whose counters are below a threshold

550
Any of most recently added child elements not removed?

555
Select sequences of interaction events associated with
the remaining elements as frequent sequences

559
RETURN

Perform Frequent Sequence
Analysis - Single-Pass
Subroutine

430

Fig. 5B

Receive groups of interaction data and other
information to be used for the analysis

560

563

Determine the interaction events that frequently occur
in the interaction data groups

566

For each sequence of determined interaction events of
a specified length, determine if the sequence is present
in more of the interaction data groups than a threshold

568

Create a tree data structure where each element other than
the root element represents one of the determined interaction
events, and such that each hierarchical sequence of elements
of the specified length represent a sequence of interaction
events that was one of the determined sequences

Initialize counters for each element

570

Select next interaction data group

573

Increment counter for each element whose associated
sequence of interaction events is present in the selected group

576

Yes More groups?

578

No

580

Remove elements whose counters are below a threshold

585

Select sequences of interaction events associated
with the remaining elements as frequent sequences

RETURN

589

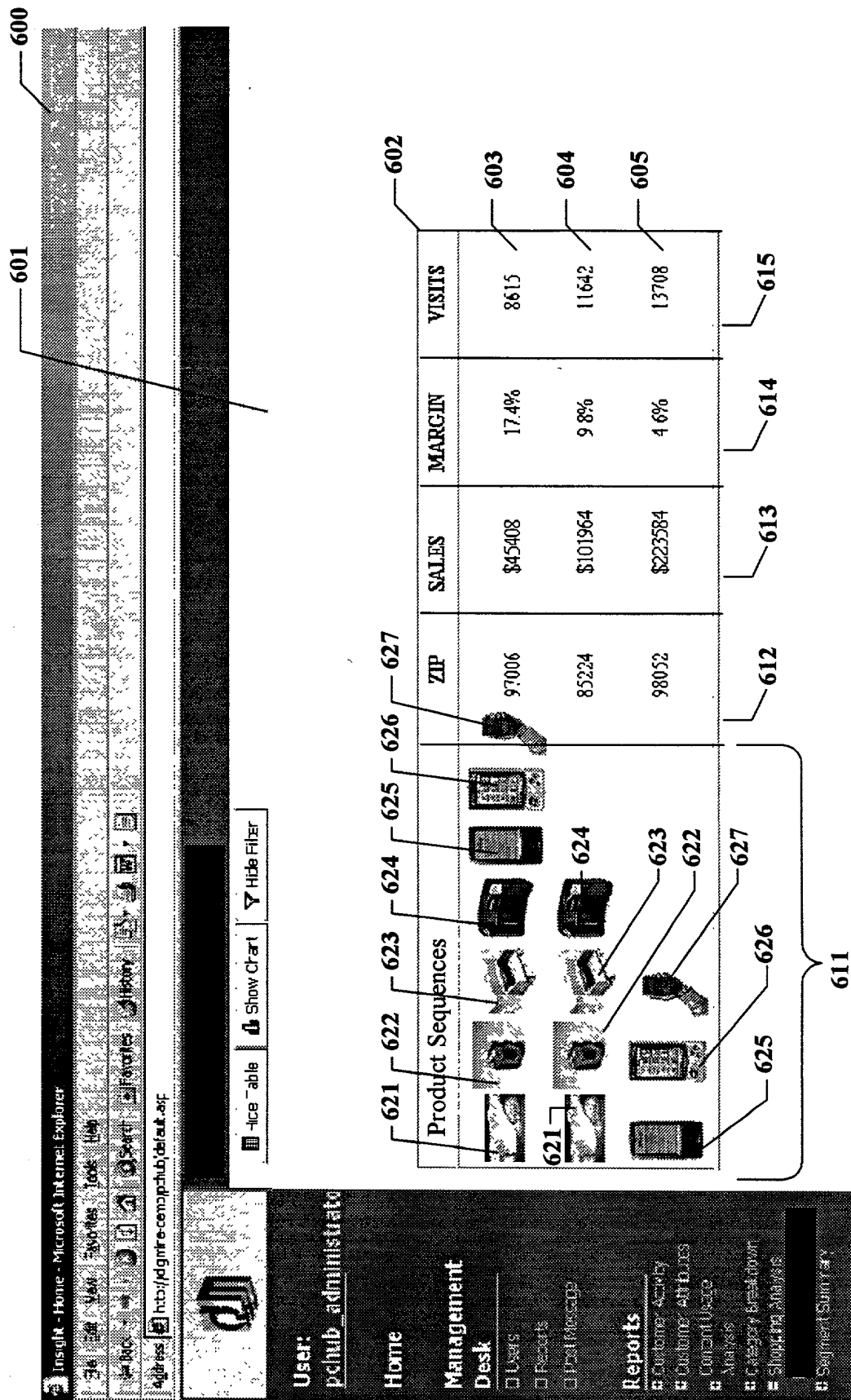


Fig. 6